

WIRELESS VEHICLE SYSTEM FOR ENHANCING SITUATIONAL AWARENESS

[0001] This application is a continuation of U.S. non-provisional patent application Ser. No. 13/605,245 filed Sep. 6, 2012, which is hereby incorporated by reference herein in its entirety. This application claims the benefit of and claims priority to U.S. non-provisional patent application Ser. No. 13/605,245 filed Sep. 6, 2012.

BACKGROUND

[0002] This relates generally to mobile electronic equipment such as equipment in a vehicle and, more particularly, to systems in which a vehicle obtains situational awareness information from wireless transmissions from nearby vehicles.

[0003] Vehicles are sometimes provided with safety equipment such as parking sensors, lane departure warning equipment, and blind-spot detection systems. A parking sensor can be used to alert a driver when a vehicle is nearly in contact with a parked car or other stationary object, but has limited range and cannot be used to increase safety when a vehicle is being driven on a highway. Lane departure warning equipment can sense when a driver has started to drift into an adjacent lane, but does not warn the driver about vehicles in the adjacent lane. Blind spot detection systems can use radar or an infrared sensor to monitor a driver's blind spot, but do not offer complete coverage of areas around the driver's vehicle and provide no information to the driver on the nature of intrusions into the driver's blind spot.

[0004] It would therefore be desirable to be able to provide improved systems for providing drivers in vehicles with enhanced situational awareness when driving on a road.

SUMMARY

[0005] Electronic equipment in vehicles may transmit and receive wireless messages. Wireless protocols such as the Bluetooth® Low Energy protocol may be used in transmitting and receiving the messages.

[0006] Each vehicle may contain multiple transmitters. For example, in a rectangular vehicle with four corners, a transmitter may be located at each of the four corners. Transmitters may be calibrated so that signal strength information may be used in gauging the distance between the transmitters and receiving equipment in another vehicle.

[0007] Each wireless message that is transmitted by a transmitter may include information on the vehicle from which it is being transmitted, information on the location of the transmitter within the vehicle, and other vehicle status information. Receiving equipment in vehicles may be used to receive the transmitted messages.

[0008] Received signal strength indicator information may be associated with the messages. Using the received signal strength indicator information and information on the locations of the transmitters within the vehicles in which the transmitters are installed, equipment in a receiving vehicle may determine the locations of nearby vehicles. Satellite navigation system signals may be used in identifying the location of a vehicle that is being driven. Electronic equipment in a vehicle may present an icon of the vehicle that is being driven on a display.

[0009] Alerts may be presented to a driver of a vehicle based on the locations of nearby vehicles, vehicle type

information, and other information regarding traffic in the vicinity of the driver. For example, icons of nearby vehicles may be presented on the display adjacent to the icon of the vehicle that is being driven. A driver may also be alerted to the presence of nearby emergency services vehicles. Vehicle type information may also be used to help drivers identify nearby vehicles such as motorcycles and trucks.

[0010] Further features of the invention, its nature and various advantages will be more apparent from the accompanying drawings and the following detailed description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a schematic diagram of illustrative electronic equipment in accordance with an embodiment of the present invention.

[0012] FIG. 2 is a diagram showing how multiple pieces of equipment in vehicles traveling on a road may wirelessly interact with each other in accordance with an embodiment of the present invention.

[0013] FIG. 3 is a diagram of a vehicle such as a truck that has been provided with wireless transmitters in accordance with an embodiment of the present invention.

[0014] FIG. 4 is a diagram of a vehicle such as a motorcycle that has been provided with wireless transmitters in accordance with an embodiment of the present invention.

[0015] FIG. 5 is a diagram of a vehicle such as an automobile that has been provided with wireless transmitters in accordance with an embodiment of the present invention.

[0016] FIG. 6 is a diagram showing how a wireless transmitter that is transmitting through a relatively thick portion of a vehicle body may be configured to transmit wireless signals at a relatively large power to ensure that output from the vehicle is properly calibrated in accordance with an embodiment of the present invention.

[0017] FIG. 7 is a diagram showing how a wireless transmitter that is transmitting through a relatively thin portion of a vehicle body may be configured to transmit wireless signals at a relatively small power to ensure that output from the vehicle is properly calibrated in accordance with an embodiment of the present invention.

[0018] FIG. 8 shows an illustrative display screen in a vehicle that is displaying an alert to provide a driver with enhanced situational awareness such as a diagram of the driver's vehicle and nearby vehicles driving on the same road in accordance with an embodiment of the present invention.

[0019] FIG. 9 shows an illustrative display screen in a vehicle that is displaying an alert to a driver concerning the presence of a nearby emergency vehicle in accordance with an embodiment of the present invention.

[0020] FIG. 10 is a flow chart of illustrative steps involved in wirelessly gathering signals such as locally broadcast wireless messages and satellite navigation system data to use in ascertaining location and providing drivers in vehicles with enhanced situational awareness in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION

[0021] Electronic equipment may be provided with wireless transceiver circuitry. For example, mobile electronic equipment such as electronic equipment in a vehicle or other mobile structure may also be provided with the ability to